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A NON CONVENTIONAL THERMODYNAMICAL MODEL FOR NANOCRYSTALS WITH DEFECTS OF DISLOCATION *

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Abstract

In the framework of the extended irreversible thermodynamics a non conventional description for nanocrystals with defects of dislocation is given, introducing a second order dislocation tensor *à* la Maruszewski, its gradient and its flux as internal variables in the thermodynamic state vector. Liu's theorem is used to analyze the entropy inequality and to derive the laws of state, the affinities, the entropy flux and the residual inequality. To close the system of equations illustrating the behaviour of the media under consideration, the constitutive equations and the rate equations for the dislocation field, its flux and the heat flux, presenting a relaxation time and describing disturbances propagating with finite velocity, are derived, in a first approximation. The behaviour of dislocation defects in nanostructures is one of the challenges in the so called "defects engineering", because they have a direct influence on mechanical and transport properties. The obtained results have applications in nanotechnology and several fields of applied sciences.

1 Introduction

The models for nanocrystals with defects of dislocation may have relevance in many fundamentals sectors of nanotechnology. Understanding the influence of dislocations on mechanical and transport properties in miniaturized

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